United States Mission Control Center (USMCC)

Functional Requirements Document

1 February 2000

Version 1.1

FG USMCC FUNCTIONAL REQUIREMENTS
DOCUMENT CHANGE HISTORY

VERSION	DATE	SUMMARY
Draft	9/30/96	Developed to be used as the basis for the September 30, 1996 Requirements Review of on-line functions to be replaced.
Final Draft	10/15/96	Incorporated changes recommended at the Requirements Review.
Version 0.1	7/1/97	Added Chapters 11 - 15 which expanded the scope of the document to include the requirements for the USMCC off-line functions and manual operations. It also included changes collected from 10/15/96. This document was placed under configuration management and requires NOAA approval before any changes are made.
Version 1.0	10/17/97	Incorporated all approved changes that resulted from the document review that began in July 97.
Version 1.1	2/1/00	Included specific requirements for Interference Monitoring Subsystem

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1.0 INTRODUCTION

1.1 PURPOSE

The Functional Requirements Analysis Document (FRD) provides a description of the functional requirements for the Fourth Generation United States Mission Control Center (FG USMCC). The FG USMCC consists of seven functional areas and will be operated by the National Oceanic and Atmospheric Administration (NOAA) of the US Department of Commerce (DOC), as part of the United States Sarsat Ground System, shown in Figure 1. The Sarsat Ground System, in turn, is part of the international Cospas-Sarsat (C-S) satellite aided Search and Rescue (SAR) system, described below.

When fully implemented, the system will provide a complete replacement for the present NOAA USMCC located in FOB 4, Suitland, MD. The FG USMCC will perform functions that are similar, but not identical to, the current USMCC.

1.2 HISTORIC BACKGROUND

The current Cospas-Sarsat Search and Rescue System is a satellite-based system for detecting and locating ships and aircraft in distress. Starting in October 1976, the United States Interagency Committee on Search and Rescue (ICSAR) ad hoc working group on satellites recommended the development of a low-orbiting satellite system for detecting and locating distressed aircraft and vessels by means of their Emergency Locator Transmitters (ELTs) and Emergency Position Indicating Radio Beacons (EPIRBs). Since then, many countries have joined the system of Cospas and Sarsat satellites, local ground tracking stations (Local User Terminals or LUTs), message collection and distribution centers (Mission Control Centers, MCCs) and connecting communications lines, to form a network for the rapid collection, processing and distribution of distress information to rescue forces around the world.

Simply stated, the concept involves the use of multiple satellites in low, near-polar orbits 'listening' for distress transmissions from emergency beacons. The signals received by the satellite are relayed to the network of C-S ground stations where the location of the emergency is determined by measuring the Doppler shift induced by the satellite motion relative to the distress signal. The fact than an alert has been detected, along with the location information, is then relayed by way of a national Mission Control Center to an appropriate national Rescue Coordination Center (RCC) or to another international MCC for initiation of the Search and Rescue activities. In addition, the system has recently been expanded to augment the Low Earth Orbiter (LEO) data with data from satellites in geosynchronous (GEO) orbit, providing almost instantaneous detection and relay of distress signals through the same LUTs and MCCs.

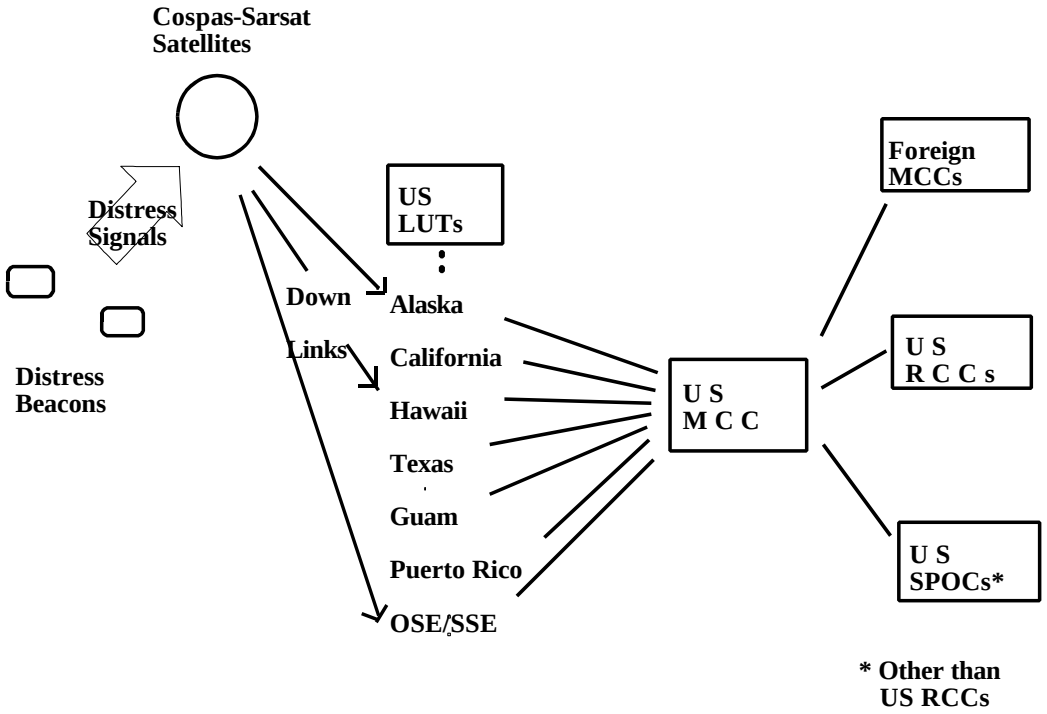

Figure 1. Sarsat Ground System

1.3 EXISTING USMCC FACILITIES AND OPERATIONS

The present USMCC is the central part of the US Sarsat Ground System, shown in Figure 1. Data from the 14 US LUTs (two per site) is communicated to the USMCC, where it is processed and sent to US RCCs, foreign MCCs, and US SPOCs. Software for the USMCC was contractor-developed and is contractor-maintained and operated. Operations are under the direction of the NOAA SARSAT Operations Manager. The major data processing components are shown in Figure 2. The primary and backup on-line processors are Hewlett-Packard (HP) Vectra 486/66ST processors, with associated disk, tape, printer and textual and graphic terminal peripherals. Primary software is 'C' language code running under DOS 6.22, connected to a LAN. The LAN provides interconnection with the remainder of the USMCC supporting processors including database maintenance, pass schedule processing, monitoring processors and mapping analysis. Communication interfaces include X.25, TELEX, FAX, and voice. The major functions of the current USMCC are:

A) To receive and process data and messages from the US LUTs and from foreign MCCs, regarding distress beacon receptions, via both LEO and GEO satellites; to form and issue alert messages to RCCs MCCs, and SPOCs based on these LUT and MCC receptions.

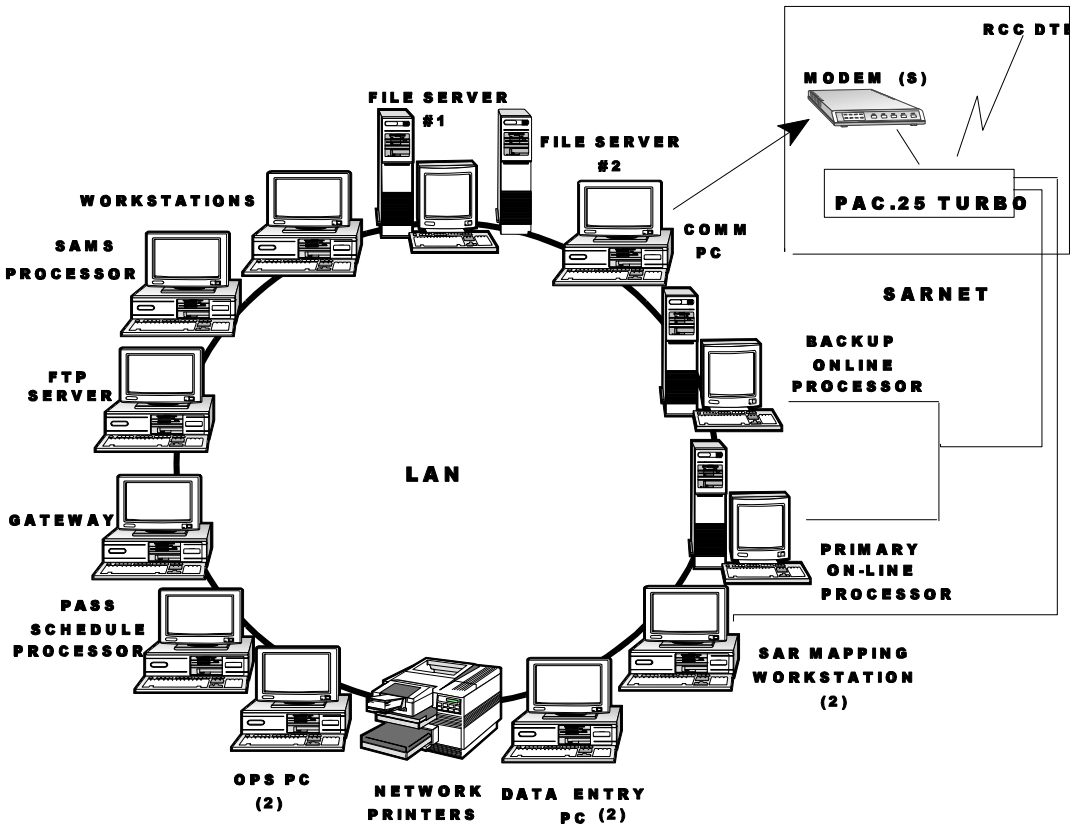

Figure 2: Major USMCC Processing Components

B) To schedule, monitor and control the US LUTs that collect the satellite data, and record and summarize for management review the operational performance of the US LUTs.

C) To receive and process Cospas-Sarsat system data including SAR telemetry data, ephemeris data, time calibration data, and system status information; to provide warnings of out of tolerance conditions, and disseminate these and orbit vector data to other MCCs; and to provide orbit vector data to US LUTs.

D) To serve as an information source and coordination center for US RCC personnel and for foreign MCCs and SPOCs, regarding active and historic SAR incidents; and to provide daily updates to NOAA management regarding Sarsat system operations.

E) To detect system failures, including those in the USMCC itself; to provide warnings of system malfunctions to other MCCs and to NOAA management; to reconfigure the US LUTs and USMCC as required to maintain continuous system availability.

F) To establish, maintain, and expand data bases for incident histories, beacon registration, LUT, beacon, and satellite performance, SAR Region geography, historic input data, output messages, MCC transactions, and SAR site histories.

G) To support changes to the US LUTs and USMCC configuration, according to the needs of the NOAA management and of the C-S community, including tests, demonstrations, and improvements to the USMCC itself.

1.4 FG USMCC FACILITIES AND OPERATIONS

The FG USMCC, when fully developed, will occupy the same space as the current USMCC, which is located on the third floor, Wing 3, Room 3335, Federal Building (FB 4), NOAA/NESDIS, Suitland, Maryland. The FG USMCC will be developed off-site, will be parallel tested with the current USMCC, and then replace it in the Suitland site. The FG USMCC is to perform the same functions of the current USMCC, with the following features:

a) The FG USMCC will provide as high level of reliability, modifiability, and maintainability, to be achieved by redundant hardware and software elements.

b) The FG USMCC will carry out continuous software checking of LUT, satellite, and USMCC performance, so as to provide rapid notification of failure or extra-normal performance.

c) The FG USMCC system will provide expansion capability for functions such as automatic generation of data for system management and management support, and support of US and C/S tests and demonstrations.

The FG USMCC will be designed to fit into the current US and C-S SAR system with minimal impact on existing operations. It will replace or assimilate all of the present USMCC software and equipment. It is expected that the FG USMCC will operate based on a distributed processing system with shared file access and maximum redundancy to carry out the functions of the FG USMCC as described in this document. The number of processors may be more, or less, than the number of functions performed.

1.5 ORGANIZATION OF THIS DOCUMENTATION

The next section of this document (Section 2) provides a definition of the FG USMCC system and its functional processes. The details of the overall system requirements are also given in this section. Sections 3 - 14 detail the requirements for each of the FG USMCC functional areas including system performance requirements. Section 15 details the requirements for the manual part of the operation of the FG USMCC.

2.0 FG USMCC SYSTEM DEFINITION

2.1 SCOPE

This section provides the overall system requirements and briefly describes the major functions included in the FG USMCC system so as to identify their major interfaces. Figure 3 provides a context diagram for the FG USMCC which details the categories of input and output that the FG USMCC must handle.

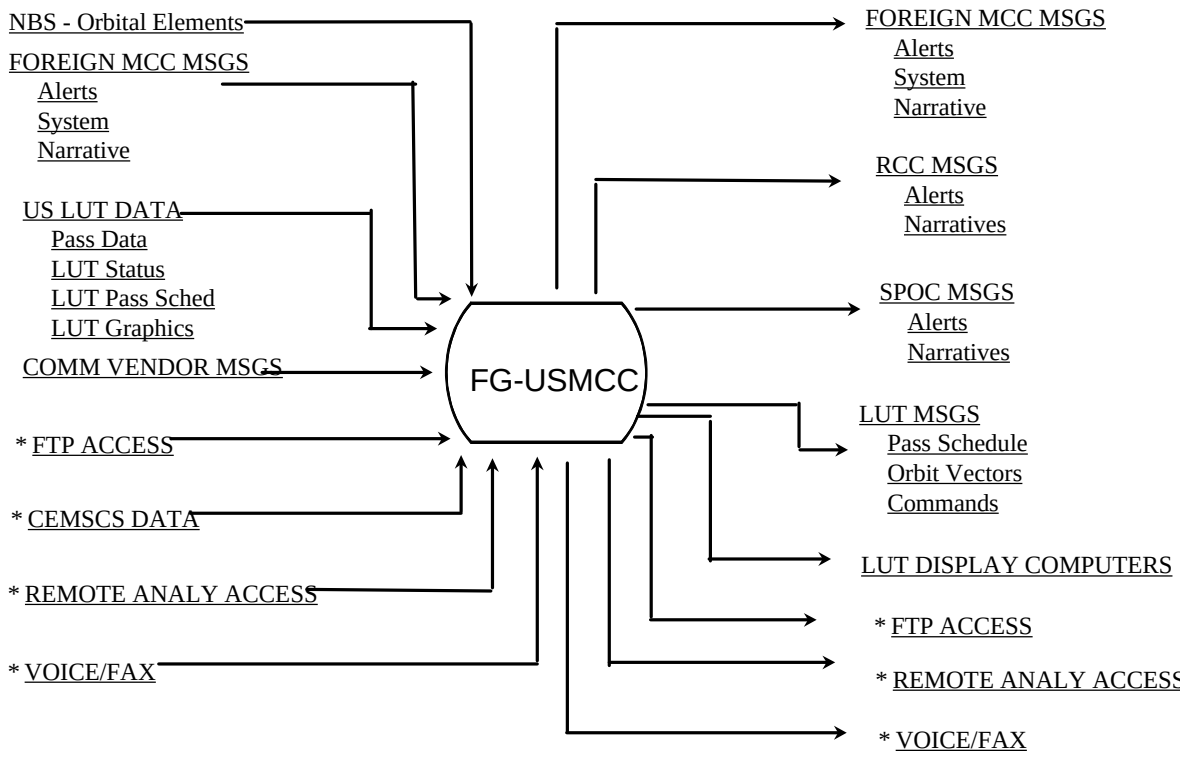

Figure 3: FG USMCC Context Diagram

The major FG USMCC functions are illustrated in top-level hierarchy chart shown in Figure 4. The individual functions do not necessarily coincide with individual processors.

2.2 SYSTEM REQUIREMENTS

2.1 The applications software for the FG USMCC shall require new development, but where possible, algorithms used currently by the USMCC shall be used. All applications software shall become Government owned property at the time of system delivery.

2.2 FG USMCC software shall require no change in the LUT or MCC inputs, or in the message outputs of the USMCC, other than what is necessary to meet new requirements or constraints as

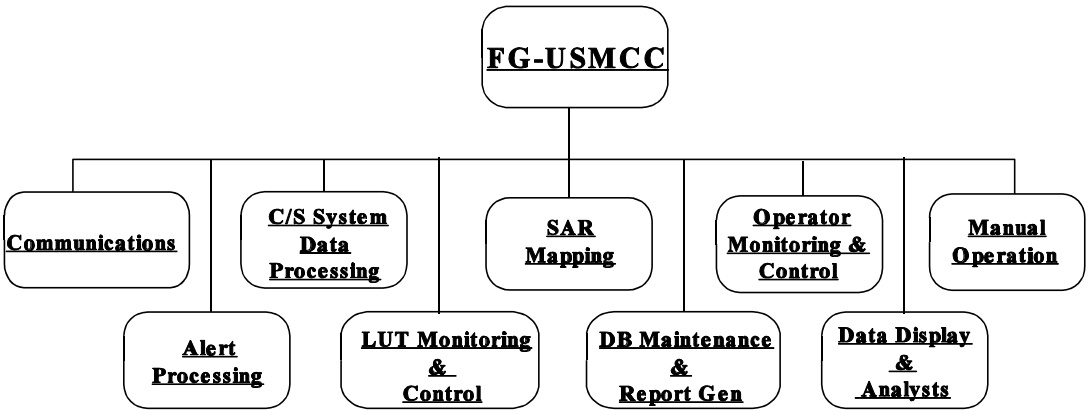

Figure 4: FG USMCC Functional Hierarchy

defined by NOAA during development.

2.3 The FG USMCC shall be developed without interruption or modification of operations to the present USMCC, other than what is specified by NOAA.

2.4 Testing and commissioning of the FG USMCC shall be in accordance with a plan approved by NOAA.

2.5 Software and hardware developed and used in the FG USMCC shall be YEAR 2000 compliant.

2.6 To the maximum extent possible, the FG USMCC shall use Commercial Off-The-Shelf (COTS) software to satisfy the utility software requirements of the operational system. This includes operating system software, data base software, communications interface software, graphics software and menu development software. This will be done for both efficiency of development and maintainability.

2.7 The FG USMCC development shall be based on the concept of distributed processing using shared files to provide maximum accessibility. However, the major FG USMCC functions do not necessarily correspond to individual processors. This requirement applies specifically to the on-line functions detailed in Chapters 1-10. It will also apply to any future modifications or additions made to the off-line functions (Chapters 11 - 15).

2.7.1 The FG USMCC must have the capability to switch any process from one workstation to another workstation.

2.7.2 The FG USMCC must have at least one workstation capable of picking up the

workload of any active workstation.

2.8 All FG USMCC processors shall be capable of performing self-testing and monitoring.

2.8.1 If bad or corrupted data is encountered or calculation errors result from such bad or corrupted data, the FG USMCC software shall skip that data, log the occurrence and send a message to the Controller. Under no circumstances shall the FG USMCC software crash because it encountered corrupted data or calculation errors.

2.8.2 All FG USMCC processes shall stage their data to shared storage in such a fashion that in the event of an unexpected shutdown or failure, each process can cleanup and continue processing once restarted from the last staged point. It shall not rely on local resources, since they may not be available on restart.

2.8.3 The FG USMCC shall record operations time for each processor such that it can automatically determine time between failures and length of downtime. This information shall be logged.

2.8.4 Restarting any FG USMCC process shall take no more than five minutes.

2.9 The FG USMCC system shall have the capability to perform continuous (daily, as a minimum) backup of USMCC data files.

2.10 The FG USMCC system shall provide for multiple remote access to the USMCC data. At the same time, the FG USMCC system shall provide security to protect from unauthorized access.

2.11 For all FG USMCC displays:

2.11.1 the date fields shall be displayed as either ‘Month DD, YYYY’ (e.g., September 26, 1996) or as ‘YYYY-MM-DD’ (e.g., 1976-09-26).

2.11.2 as well as query and information exchange functions that involve Standard Location Protocol beacons or National Location Protocol beacons, the beacon ID shall be defined as the hex value of bits 26 - 85 with default values used in the encoded location bits as per C/S T.001 (see Reference F.).

2.12 Program parameters, including but not limited to those controlling the number and names of satellites, LUTs, communication lines, MCCs, RCCs, SPOCs, communication addresses, I/O file paths, processing options, timing, display options, and operator controls shall be modifiable and stored in configuration files. Access to these files shall be strictly controlled. An initial, minimum set of FG USMCC configuration parameters are given in Appendix N.

2.12.1 The FG USMCC functions shall be dynamically configurable to the maximum extent possible, by authorized operator modification of the program parameters.

2.12.2 All configuration changes, including changes of system and application parameters, shall be logged in the normal course of operation.

3.0 COMMUNICATIONS REQUIREMENTS

The communications processes include the control of all data receipt and transmission to and from the USMCC via X.25, TELEX and in-house line. This includes time-tagging and numbering messages, redial in event of line drop, automatic selection of alternate mode, and logging all receipts, transmissions and statistics; sorting of input data by source and type, maintenance of input data records and queuing of messages destined for other processes; recording communications configuration and configuration changes. The communications functions include the provision of security access to the USMCC.

Requirements

3.1 The FG USMCC shall provide centralized data communication Server or gateway services for the USMCC applications, USMCC operations, and offline processes. The Communications Server shall be a stand alone processor as part of the distributed FG USMCC architecture.

3.1.1 Software shall be constructed in a modular fashion to allow for the addition of future protocols.

3.1.2 Industry standard interfaces shall be utilized when ever possible so that COTS Communication packages (i.e., X.400). can be added without a major rewrite, such as :

- Distributed Component Object Model (DCOM)
- Remote Procedure Call (RPC)
- Named Pipes File System (NPFS)
- MailSlots File System (MSFS)
- Messaging Application Programming Interface (MAPI)
- New Technology File System (NTSF)
- Registry Configuration Database Hives

3.1.3 The FG USMCC shall comply with the communication and format requirements detailed in the COSPAS-SARSAT Mission Control Centres Standard Interface Description (SID) (Reference D). For example, support shall be provided for send and receive message sizes up to 25,000 characters.

3.2 Communication Utilities - The FG USMCC shall include various utilities that shall be used by all on-line and off-line processes to interface with the Communication Server.

3.2.1 Send Data utilities shall enable applications to Send data to one or more destinations.

3.2.2 Receive Data utilities shall enable applications to Receive inputs based on Source and Data content.

3.2.3 Command Utilities shall enable the Controller and other applications to send and receive commands to perform directed task. The Communication Server shall be able to perform the following functions when commanded:

A. Load new configuration
B. Connect to one or more destinations
C. Disconnect from one or more destination
D. Send message or range of messages to one or more destinations
E. Reprocess an input and distribute to appropriate applications
F. Shutdown the Communication Server in an orderly fashion

3.3 The FG USMCC shall support the following data communications protocols

3.3.1 X.25 Packet Switched Data Network
A. Private Virtual Circuits (PVCs)
B. Switch Virtual Circuits (SVCs)
C. X.121 Called and Calling Addressing
D. Flow Control Negotiation (Packet size and Packet Window size)
E. Throughput Class Negotiation
F. Call User Data User/Password identification
G. X.29 Host to PAD: Invitation-To-Clear
H. X.32 (Dialed X.25)
I. Domestic X.25 PSDN via FTS2000/AT&T
J. International X.25 PSDN via MCI

3.3.2 Additional protocols accessed via X.25 interface
A. FTS2000/AT&T Mail send Fax
B. FTS2000/AT&T Mail send and receive Telex
C. FTS2000/AT&T Mail Receive Cancellation
D. MCI SAFe Messaging send Fax
E. MCI SAFe Messaging send and receive Telex
F. MCI SAFe Verification Message
G. MCI SAFe Cancellation Message
H. MCI SAFe Report Message

3.3.3 Asynchronous Protocols
A. Serial printer control
B. Flow Control: X-On/X-Off and RTS/CTS
C. Hayes modem
D. ANSI-BBS

3.3.4 File Transfer Protocol (FTP)

3.4 Communication Configuration

3.4.1 The Communication Configuration shall allow various combinations of Communication Protocols to communicate with each of the USMCC's SARSAT Communication Sites. The configuration must support one or more Communication Path with the possibility of different protocol to each Communication Site.

3.4.2 Communication Site/Path Configuration parameters are provided in Appendix N.

3.4.3 Some of these Communication Paths may be grouped in an ordered set for automatic alternate routing. An example of such an automated Communication Path Set shall be the routing of calls to dual US LUTs:

- First the call shall be sent out over the Primary FTS X.25 circuit in Suitland
- If that call fails, the call shall be sent out over the Secondary FTS X.25 circuit in Suitland
- Finally if they both fail, the call shall be sent out the X.32 circuit in Suitland.

If any other technique is required other than the first path, then operations shall be notified. These paths can be used in an automated fashion since the technique has little or no impact on the destination. Other path types may require additional coordination with the destination prior to using an alternate path. Automatic path fall back shall not be done indiscriminately, since in this example X.32 calls will result in a long distant phone charge that may stay active for a long time.

3.4.4 Communication Destinations

Table 1 provides details of the anticipated FG USMCC's SARSAT Communication Sites and Protocols.

3.4.5 Data Communication Interfaces shall be configurable and modifiable by appropriate USMCC personnel without impacting other interfaces. Although this document contains information about specific Communication Sites and Protocols, these details shall not constrain future capabilities.

3.4.6 There shall not be any limitations on the number of Communication Sites or Communication Paths that can be supported.

3.4.7 Each communication interface shall be maintained in such a manner that all communication interfaces are serviced on demand and that the failure or a bottle neck on one interface shall not impact other interfaces.

Table 1: SARSAT Communication Site/Protocol Table

SARSAT Communication Site/Protocol Table			
Communication Site	**Primary Protocol**	**Secondary Protocol**	**Tertiary Protocol**
6 Dual LUTs	FTS X.25 - Full Duplex	SARNET X.32 - Full Duplex	
MD LUT (SSE)	SARNET X.25 - Full Duplex		
OSE LUT	SARNET X.32 - Full Duplex		
LUT Display Processors 1 & 2	SARNET X.25 - Full Duplex		
NOAA/CEMSCS	SARNET X.25 PVC - Inbound simplex	(Future FTP?)	
NASA GOES LUT	FTS X.25 - Full Duplex		
16 RCCs (USCG, USAF, NOAA)	FTS X.25 - Full Duplex	FTS Mail Fax	
Panama SouthJ	MCI X.25 - Full Duplex	MCI SAFe Fax	
NOAA RCC	SARNET X.32 - Full Duplex	FTS X.25 - Full Duplex	FTS Mail Fax
Federal Government 3 NASA Shuttle, Beale, DEA, Sandia Labs, USDA Forest, USCG NRS, NSFA	FTS Mail Fax	MCI SAFe Fax	
55 State RCCs	FTS X.25 - Full Duplex	FTS Mail Fax	FTS Mail Printer
20 MCCs	MCI X.25 - Half Duplex	MCI SAFe Telex	
15 SPOCs	MCI SAFe Telex	MCI SAFe Fax	MCI X.25
COSPAS-SARSAT Secretariat	MCI SAFe Fax	FTP	

SARSAT Communication Site/Protocol Table			
Communication Site	**Primary Protocol**	**Secondary Protocol**	**Tertiary Protocol**
NAVAL BBS	ANSI-BBS -Full Duplex		

Table 2: Vendor Communication Site/Protocol Table

Vendor Communication Site/Protocol Table			
Communication Site	**Primary Protocol**	**Secondary Protocol**	**Tertiary Protocol**
FTS Mail Output Message Delivery	FTS X.25 - Full Duplex	FTS X.32 - Full Duplex	SARNET X.32 - Full Duplex
FTS Mail Input Message Receipt	SARNET Async PAD Dialup/X.25 - Simplex Input		
MCI SAFe Output Message Delivery	MCI X.25 - Full Duplex		
MCI SAFe Input Cancellation, Verification, Report	MCI X.25 - Simplex Input		

3.4.8 Data shall be accepted from remote sites via any protocol, regardless of the current output configured protocol, even if the source is unknown. All data from unknown sources are written and sent to the operator. If invalid data continues to be received from an unknown source, the connection shall be terminated.

3.5 Communication Processing

3.5.1 A time stamped detailed log shall be maintained in time order that includes a transaction record of all data sent, received, processed, sources, destinations, errors encountered, configuration changes, etc. Each entry in the log will include a time stamp.

3.5.2 All input and output data and network headers shall be time stamped and archived in time order and in the format that they are sent or received. The FG USMCC shall be configured such that the archiving of any input or output data can be suppressed based on source/destination and message type.

3.5.3 All input data received shall be verified as much as possible with regard to data format and range checks performed when possible. If errors are detected, the Controller shall be notified of the error with an indication where the error is located

in the message and why it is bad. Messages with errors shall be placed in a file along with all other Narrative messages.

3.5.4 All of the following carriage control shall considered a valid end-of-line sequence on input:

A. $(^{C}_{R})(^{C}_{R})(^{L}_{F})$
B. $(^{C}_{R})(^{L}_{F})$
C. $(^{C}_{R})$
D. $(^{L}_{F})$
E. $(^{L}_{F})(^{C}_{R})$
F. $(^{F}_{F})$

3.5.5 The Converted Received input data is then passed to all processes that are configured to use this data and it is simultaneously written to permanent archive file.

3.5.6 Messages created for output shall be formatted using standardized and globally available definitions that use internal Intel based character and number formats. Once a message has been prepared, it is passed to the Communication Server along with a list of destinations of where it is to be transmitted.

3.5.7 When data is first passed to the Communication Server for output and the associated interface is not currently processing data for output, the current primary site configuration must be loaded. This will make sure that if there are any recent configuration changes, they will be loaded the next time a connection is established.

3.5.8 All output data passed to the Communication Server from other configured processes, shall be pre-formatted and queued for transmission to the appropriate destination(s). The Communication Server shall format these messages for output, based on destination type, Communication Protocol to be used. Also, date, time, and message sequence numbers will be added just prior to transmission.

3.5.9 The following output end-of-line carriage control shall configurable on site path basis:

A. $(^{C}_{R})(^{C}_{R})(^{L}_{F})$
B. $(^{C}_{R})(^{L}_{F})$
C. $(^{C}_{R})$
D. $(^{L}_{F})$

3.5.10 A connection shall be made for any sites that have queued data that is ready for output. If that site is already connected inbound to the Communication Server and the site is not configured for full duplex communications, then the connection shall have to wait until the current connection is cleared.

3.5.11 If this path fails to establish a connection and the path is configured to automatically

try the next path, then the next site/path configuration shall be loaded. If the current formatted message that is ready for transmission is not formatted consistent with the new path, they all must be reformatted prior to establishing the connection.

3.5.12 The remaining messages will be pre-formatted for output while transmission is in progress so that messages will be sent as quickly as the destination can receive them, unless they are already properly pre-formatted.

3.5.13 All queued output data shall be sent to each destination within two minutes. A messages is removed from the queue and final formatting is performed (message numbers, date and time added). The message is then transmitted and if successful, the next message sequence number is updated.

3.5.14 Since the FG USMCC will be able to transmit data faster than destinations will be able to receive the data, the volume of output data shall be considered when determining when to drop the connection to the remote destination. Once the appropriate network data delivery time and idle circuit time has passed, the virtual circuit shall be cleared.

3.5.15 An Invitation-To-Clear shall be sent only to destinations that are configured to accept an Invitation-To-Clear. Otherwise, a Clear shall be sent.

3.5.16 Once an Invitation-To-Clear or a Clear has been sent or received, no additional data can be sent on the virtual circuit until it has been cleared.

3.5.17 When an Invitation-To-Clear is received the Communication Server shall respond with a Clear, unless the volume of data sent is not likely to have arrived at the destination. If so, then respond with an Invitation-To-Clear. This scenario should only occur on virtual circuits that support full duplex communication. If the destination is not configured to receive an Invitation-To-Clear, a Clear shall be sent after the appropriate amount of time has passed.

3.5.18 If an Invitation-To-Clear is received after having previously sent an Invitation-To-Clear on the same virtual circuit, then Communication Server shall respond with a Clear.

3.6 All communication functions that are issued, must also be safeguarded with timers. These configurable timers will assure that the associated operation completes in a reasonable amount of time. In the event that one of these timers expire, the associated operation shall be canceled, the event logged, operator notified, reset or cleared, and attempt to recover. The following communication operations shall be safeguarded with a timer by site:

A. X.25 Call
B. X.25 Send
C. X.25 Receive, when data is expected

D. X.25 Invitation-To-Clear
E. X.25 Clear

3.7 The Communication Server shall make available its current data, logs, etc. to offline processes and users on the SARSOD LAN. In the event that the SARSOD LAN is not available, processing shall continue uninterrupted.

3.8 The Communication software must also allow for off line processes to read and in some cases write to shared areas without interruption of the Communication Server.

3.9 Communication Splitter/Router - The FG USMCC shall be capable of supporting Parallel Processing and off-line testing. This process shall provide access to operational data without interfering with the normal traffic flow.

3.9.1 WAN Call in virtual circuits will be routed to the Primary local DTE and Split off to zero or more Secondary local offline DTEs.

3.9.2 All data received on the WAN Call in virtual circuit will be sent to all Primary and Secondary local DTEs.

3.9.3 All responses (call accept, data, clears, etc.) received from the Primary local DTE will be relayed to the WAN call in virtual circuit.

3.9.4 All responses (call accept, data, clears, etc.) received from the Secondary DTEs shall be ignored, other than to be recorded for analysis.

3.9.5 All calls received from the Primary local DTE shall be routed to the WAN and not to any of the Secondary local DTEs.

3.9.6 All calls and data received from the Secondary local DTEs shall be accepted and recorded for analysis.

3.10 Voice communication shall be via government furnished unrestricted domestic and international telephone lines and equipment.

3.11 USMCC Manual FAX communications shall be via government furnished unrestricted domestic and international telephone lines on the USMCC Fax machine and various workstation Fax modems.

3.12 The FG USMCC shall be able to send and receive data from the US LUTs in accordance with the LUT Data Transfer Specifications (Reference G).

3.12.1 The FG USMCC shall be able to send data to a LUT (in a transaction it has initiated) concurrent with receiving data from that LUT (in a transaction initiated by the LUT).

3.12.2 The FG USMCC shall be able to request pass data by:

- LUT and pass,
- LUT and time range, or
- all LUTs and time range

for at least 24 hours.

3.12.3 The FG USMCC shall be able to recover LUT data at least at a ratio of 6 to 1 (i.e., 6 hours of data can be received, processed, and distributed in no more than 1 hour.

5.0 LUT MONITORING AND CONTROL REQUIREMENTS

These functions comprise the construction of US LUT Pass Schedules, transmission of Pass Schedules and Orbit Vectors to the US LUTs (via Communications), monitoring LUT pass data and incident solution headers received at USMCC; checking of the LUT Orbit Vectors contained in the LUT solution files, checking and display of LUT status as well as LUT communications and DTE.

Requirements

5.1 The FG USMCC shall have the capability to check LUT Orbit Vector information received as part of the pass data against the orbit vectors available at the USMCC. The FG USMCC shall log the results of the check and generate an alarm to the controller if the magnitude exceeds a configurable parameter.

5.2 The FG USMCC shall send current orbit vectors for all operational COSPAS and SARSAT satellites to the LUTs regularly throughout each day in the format specified in the LUT DTS (Reference G). The transmission times and satellites involved shall be configurable parameters.

5.3 Daily, at a configurable time, the FG USMCC shall produce LUT Pass Schedules for the next 2 day period The FG USMCC shall distribute these Pass Schedules to the LUTs in DTS format (Reference G) and to RCCs in the format described in Appendix K.

5.3.1 The FG USMCC shall verify the schedule returned from the LUT. If the returned schedule does not match the USMCC Master Pass Schedule, the FG USMCC shall notify the operator who shall be able to retransmit the schedule.

5.3.2 The FG USMCC shall store the Master Pass Schedule in a shared file in the format described in Appendix L for use by other processes.

5.3.3 The FG USMCC shall log the occurrence of each event as well as any anomalies that occur in the process of sending and verifying the schedule.

5.4 The FG USMCC shall log status information from all US LUTs. This information shall be made available for display and include

5.4.1 Next Pass Parameters
- Satellite
- Orbit #
- AOS
- LOS

5.4.2 Results of Last Pass
- Satellite
- Orbit #
- AOS

LOS
121.5 Solutions
243 Solutions
406 Solutions
Regional 406 Solutions
Global 406 Solutions

5.5 The FG USMCC shall provide an Operator Interface to allow the operator to command the LUTs to take or suppress specific passes. The FG USMCC shall log all such changes as well as writing the change to the LMDB.

5.6 The FG USMCC shall monitor the performance of all US LUTs based upon information available from each pass.

5.6.1 The FG USMCC shall check the Master LUT Pass Schedule to determine when passes are due to be received at the USMCC. If the pass is received within 15?? minutes of the scheduled Loss of Signal, this information is logged and the USMCC Master Pass schedule will be updated. If the pass data are late, this will be logged and an alarm raised to the USMCC controller. The time that the pass arrives will be used to annotate the USMCC Master LUT Pass Schedule.

5.6.2 The FG USMCC shall check that all expected header records are received. If an expected header record is not received, the FG USMCC shall log this and notify the operator.

5.6.3 The FG USMCC shall check the number of solutions in each type of alert data file. The Master LUT Pass Schedule shall be annotated to reflect this information.

5.7 Once per week, the FG USMCC shall check all communications lines and devices at the US LUTs. Results from the checks shall be logged and an alarm raised to the Controller if a failure is detected.

6.0 SAR MAPPING REQUIREMENTS

This process comprises (1) the display of a world map with selectable zoom capability, showing US RCC areas, SPOC regions and C/S MCC Service Area boundaries, (2)selective display of Active, Closed and Archived Sites at 121.5/243.-MHZ, 406-MHZ, including interferer sites, test sites, with coding for hit multiplicity, on the world map, (3) geosorting of locations passed to it by the Alert Process and Operator Control Process, (4) generation and maintenance of Geosort regions.

Requirements

6.1 The FG USMCC shall have the capability to determine (Geosort) the Service Area (SA) code (for foreign MCCs) or Search and Rescue Region (SRR) (for US RCCs/SPOCs) code for any location requested automatically as part of alert processing or manually by the USMCC Controller. These areas will be defined by Maritime Identification Digits (MID) code or appropriate codes assigned by NOAA.

6.2 The FG USMCC shall have the capability to add, delete or update SAs/SRRs (Geosort regions) without interrupting the USMCC operation.

6.3 The FG USMCC shall have the capability to display these Geosort regions on at least two scales:

- world map that includes country boundaries
- local map(US RCC SRRs) that includes state boundaries

6.3.1 This display function shall also have the capability to “zoom” in and out in order to display localized areas.

6.4 The FG USMCC shall have the capability to display locations of sites included in the Active Site File. The types of active sites shall include:

121.5 FAs
121.5 Composites
243 FAs
243 Composites
121.5/243 FAs
121.5/243 Composites
406 Unlocated
406 FAs
406 Composites
406 Interferers
Test Beacons
Orbitography Beacons

Each site shall be represented by a unique symbol.

6.4.1 The display system shall provide the capability to select one, all, or any combination of these sites for display.

6.4.2 The display system shall provide the capability to select either open sites or closed sites

6.4.2.1 If open sites are selected, the display system shall allow selection of all open sites or sites added/updated from data received on the last pass.

6.4.2.2 If closed sites are selected, the beginning and end time (based on first detection) shall be selectable.

6.5 The FG USMCC shall have the capability to display information on any site selected from the current map display. As a minimum, the displayed information shall include:

Site ID
Type of Site
Location (if FA, A and B solution of the latest pass composite; if Composite, the latest site composite)
Frequency
Latest TCA
MID Code, Beacon Type & whether or not beacon is registered (406 site only)

The display shall have the capability to retrieve additional information from other data storage in the USMCC system, if required in the future.

7.0 OPERATOR INTERFACE REQUIREMENTS

This process includes all operator interfaces and controls, such as retrieval of last message, return of messages, response to RCC requests for O-Plots, providing operational data to the RCCs, logging of controller events, manual handling of messages into and out of the USMCC when necessary, operator modification of communications destinations lists, and all configurable system and application parameters; and manual performance monitoring and recording of the USMCC.

Requirements

7.1 The FG USMCC Operator Interface shall allow the carryover of data from screen to screen. Validation shall be performed on any changes made to critical fields. These changes shall be logged to indicate the time, and parameter name and value to which the field was changed. Provision shall be provided to enter the name of the person who made the change into the logged data .

7.2 Any configuration parameters which are not used by the operator shall be available under a different menu/password where it can be accessed and changed by senior supervisors and/or system managers. Any changes to these fields shall also be logged as per 7.1.

7.3 Functions which are not used by the duty controller, such as the drawing/modification of maps and definitions of Search and Rescue Regions or MCC service areas, shall have access changed from the duty controller to a system configuration portion of the menu which uses a separate password for access.

7.4 Any functions which need to be updated, such as 406 Encode/Decode and SIT message formats, shall be updated to reflect the current T.001 (Reference F).

7.5 The operator shall be capable of accessing related information anywhere within the menu structure (as appropriate), and shall have the capability to perform necessary actions at that level. (For example, if querying a 406 site, to directly access 406 decoding, then to print or to transmit a message pertaining to the pertinent information.)

7.6 The operator interface shall provide the duty controller with the ability to query a time period that can span up to 30 days and includes all online data as well as the ability to query archive data. One time period entry shall provide the operator with all pertinent data within that period.

7.7 The operator shall have the capability to query USMCC operator logs, and to extract or export pertinent portions to external use/reports. A capability to access other commercial software packages, such as visibility predictions, is desirable. Extraction or exchange of data between software packages shall make use of standard industry practices (i.e. highlight, drag and drop, copy/cut and past, etc.).

7.8 For ‘O Plot’ queries, the operator shall be able to enter information as requested by the customer--normally: a) latitude and longitude in degrees and minutes (and decimal minutes). The query shall be available in the form of a rectangle (first point, last point, width) or within a specified radius around a point. Units shall be selectable to accommodate different sources for the requests (i.e. nautical miles/kilometers, calendar date/Julian day, degrees/minutes or decimal degrees).

7.9 Menu commands shall be carried using ‘Windows’ technology (point & click), or by keyboard entry. Commercial software practices shall be followed wherever feasible. For example, ‘OK’ means perform the action; ‘Cancel’ or ‘Close’ exits the menu. Keyboard commands shall not be case sensitive, and shall also conform to commercial software practices (i.e. ‘Alt+P’ causes an output to printer). Pointing device (mouse) support shall be provided to simplify interfaces, for example:

- Left mouse button single click shall select an entry
- Left mouse button double click shall open the entry for viewing or processing
- Right mouse button single click shall present a pull down menu of the available options for the item clicked.

7.10 The FG USMCC shall be able to perform information retrieval in accordance with C/S A.005 for beacon information and for message information, as per section 2.8.2 and section 2.8.3 of C/S A.005.

7.11 The operator shall be able to access a list that provides a cross reference between USMCC active/closed sites, and message numbers for outgoing beacon information. These lists shall be included as part of archived data. The operator shall be provided the capability to save these lists, or portions thereof, until discarded by the operator.

7.12 The operator shall have ready visibility, through status screens, of any areas where information is being withheld from processing. The operator shall also be provided the capability to examine any withheld/queued data. Withheld data shall be saved (not be discarded) through routine housekeeping at date change, but with the option for the operator to discard it as required.

7.13 Operator screens shall, as appropriate, either use default values, or save the values that were last used on the screen to memory such that these saved values can be re-applied as screen default values when the applicable screen is next used.

7.14 Provision shall be made to bring alarms and notifications promptly to the operator’s attention for operator acknowledgment and for operator action or information. Alarms shall be prioritized and handled on a priority basis.

7.15 Units used on operator screens shall be labeled and user friendly. (For example, distance is in kilometers (km) or nautical miles (NM); dates shall use day, month and year.) Screens used to display data shall be formatted and labeled to indicate what information is being displayed.

The use of color, sound, icons, and graphical representations shall be considered in developing lower level menu items.

Requirements for individual screens are given in the Operator Interface Screen Display Description Document. (See Reference O.)

8.0 C/S SYSTEM DATA PROCESSING REQUIREMENTS

The Cospas-Sarsat System Data Processing functions involve orbit vector maintenance; processing, validation and distribution of spacecraft telemetry data; processing, validation and distribution of spacecraft Time Calibration (TCAL) parameters; processing, validating and distributing spacecraft commands; and processing and distribution of other system status data.

Requirements

8.1 The FG USMCC shall process, store and transmit acceptable (passed quality checks) orbit vector data daily or as required to the US LUTS (see Section 5 above) and foreign MCCs.

- 8.1.1 Both Cospas and Sarsat satellite orbit vectors shall be derived using the SGP-4 algorithm.
- 8.1.2 Quality checks will consist of, as a minimum, reasonable and consistency checks.
- 8.1.3 When an orbit vector fails a quality check, the FG USMCC shall log the occurrence and notify the Controller.
- 8.1.4 Identification of active satellites as well as orbit vector quality check parameters shall be configurable parameters stored in configuration files.

8.2 The USMCC will automatically process SIT 415, Time Calibration (TCAL)Data Messages. for all NOAA satellites with 406 MHZ global processing capability.

- 8.2.1 The specific satellites will be a configurable parameter as part of the time calibration configuration.
- 8.2.2 The processing will consist of a quality check of the data including a reasonableness check and consistency check.
- 8.2.3 If TCAL data fails quality check, the FG USMCC shall log the occurrence and notify the Controller.
- 8.2.4 The quality check parameters will be included as part of the time calibration configuration.
- 8.2.5 Quality checked time calibration information will be distributed as soon as possible after receipt to MCCs who request it according to configuration information. The FG USMCC shall also be capable of requesting, verifying and distributing TCAL data to US LUTs as described in the DTS (Reference G).

8.3 The FG USMCC shall convert raw SARP, SARM and SARR data received from CEMSCS to engineering values using calibration parameters and shall also check the SARR, SARP and SARM telemetry data for out-of-limits data against a set of limits.

- 8.3.1 Both the calibration parameters and the out-of-limits quality parameters shall be stored in a configuration file.
- 8.3.2 The FG USMCC shall transmit out- of -limits data to the CMCC and FMCC as appropriate. A message will be sent for each orbit in which out-of-limits data is detected.
- 8.3.3 The FG USMCC shall log the occurrence of the out-of-limits data and notify the USMCC Controller. The out-of-limits messages shall be prepared according to the

latest version of C/S A.002 (Reference D).

8.3.4 Monthly, the FG USMCC shall summarize the data received for the SARP and SARM instruments. The FG USMCC shall prepare a message to transmit to the FMCC according to the latest version of C/S A.002 (Reference D).

8.4 The USMCC shall automatically process SIT 605, System Status Messages. The processing will consist of:

8.4.1 identifying the source of the message;

8.4.2 distributing the message according to the latest version of the Data Distribution Procedures (C/S A.001, Reference E);

8.4.3 alerting the USMCC Controller of the receipt of the SIT 605 and prompting the Controller to review the message; and,

8.4.4 archiving all incoming and outgoing SIT 605s to the narrative message archive file along with the time the Controller read the incoming messages.

8.5 The FG USMCC shall support spacecraft commanding as required in the Telemetry Command Procedures document. (See Reference Q)

9.0 DATA BASE MAINTENANCE AND REPORT PREPARATION REQUIREMENTS

These functions include maintenance of all USMCC archives, including the Active Site archives, preparation of data for the Self-test And Monitoring System (SAMS), the LUT Monitoring Data Base (LMDB), the Incident History Data Base (IHDB), Large Location Errors and other files that are collected by alert processing for special processing(see Section 4); preparation of the Morning Status Report, and maintenance of system configuration documentation.

Requirements

9.1 The FG USMCC shall collect data from all 406 MHZ sites that have closed during the past 24 hours. These data will be used as attachments to the Morning Status Report.

9.1.1 The data shall be collected into 406 Information Sheets. The content and format of these sheets are found in Appendix F. In addition:

9.1.1.1 Data in the 406 Information sheets for the morning report will contain for unlocated only alerts that are suppressed (Unlocated unregistered that fail the T.001 and National Use checks):

- Field #1, General Location - fill with "UNKNOWN".
- Field #10, Comments - fill with "ALERT SUPPRESSED - BEACON ID FAILED VALIDATION CHECKS".

9.1.1.2 An asterisk shall be added to the SRR on the 406 Info sheet when the alert location is in a buffer zone. This should follow the same rules used to indicate a buffer zone on national alert messages.

9.1.1.3 Provide a copy of the 406 Info sheet for the morning briefing to a file accessible by the controllers (NOAA.OUT) when a site opens, goes to first alert, and closes.

9.1.1.4 Line 4 of the 406 Info sheet for the morning report shall reflect the sources of the GOES alerts.

4. GEO DETECT/RCVD/SRCS G8 231831 / 23 1836 / CMCC SPMCC

9.1.1.5 Line 10 of the 406 Info sheet for the morning report shall reflect when alerts are suppressed and why they were suppressed.

10. COMMENTS: ALERT SUPPRESSED - UNLOCATED UNREGISTERED SERIALIZED BEACON.

OR

10. COMMENTS: ALERT SUPPRESSED - BEACON ID FAILED VALIDATION CHECKS.

9.1.1.6 The morning report shall show the type of vessel.
8. REG DATE/VSL TYPE/VSL 10-13-92/POWER FISHING/NENITA

9.1.1.7 The Home port marina shall be input to the "PORT" field on the "406 Info" sheet including the home port city and state.

9.1.2 The time of collection shall be a configurable parameter.

9.2 The FG USMCC shall collect data to support the GEOSAR D&E.

9.2.1 Store all GEOSAR alerts in a fixed format file similar to the IHDB. Key data elements to capture shall include satellite, source, time of detection, number of integrations, time of receipt and if ID was valid.

9.2.2 Indicate time of receipt of first GEOSAR alert (SIT 145) along with GEOSAR satellite in the IHDB.

9.2.3 Indicate the beacon turn off time in the IHDB as provided by the GEOSAR system. This only needs to be done if the beacon turn-off time is going to be provided in a message. This will involve a field to output the data to the IHDB.

9.3 The FG USMCC shall make data from closed Active File sites available on shared files for off-line data bases and processes (e.g., SAMS, LMDB, Large Location Error Reporting). Data items and formats are in Appendix G.

9.4 The FG USMCC shall archive data on a daily basis. Data shall be organized into individual files that contain:

9.4.1 MCC Input/Output Messages
9.4.2 RCC/SPOC Input/Output Messages
9.4.3 Closed Sites
9.4.4 LUT Pass Data
9.4.5 Suppressed Data
9.4.6 Special Processing Data
9.4.7 Logs
9.4.8 Alarm Messages
9.4.8 Configuration Changes
9.4.9 Pass Schedules
9.4.10 Narrative Messages
9.4.11 LUT Pass Schedule
9.4.12 MCI Messages

9.5 The FG USMCC data base shall be constructed to allow ad hoc queries of input and output data using off-the-shelf access programs (e.g., Word, WordPerfect, Access)

9.6 The FG USMCC shall store output data in such a way that the messages can be viewed “as they went out.

9.7 The FG USMCC shall store input and output data as they were presented to communications or sent by communications along with any and all communications vendor protocols and messages.

10.0 PERFORMANCE REQUIREMENTS

10.1 The FG USMCC shall transfer (10) 121.5 MHZ and (40) 406 MHZ beacons from the LUTs within 10 minutes.

10.2 The FG USMCC shall maintain a ratio of less than 0.1 for lost messages.

10.3 The FG USMCC - US LUTs communication links shall have an availability of 95%.

10.4 The FG USMCC to foreign MCC communication link shall have at least one medium available 99% during each calendar day.

10.5 The FG USMCC shall be capable of processing

10.5.1 (20) 121.5/243 MHZ/406 Interferer and (100) 406 MHZ locations from one satellite pass.

10.5.2 (2000) 121.5/243 MHZ/406 Interferer and (2000) 406 MHZ active sites.

10.6 The FG USMCC shall be capable of processing at least 15 system messages per day.

10.7 The maximum processing time for all alert data shall not exceed 30 minutes.

10.8 The FG USMCC computation shall not introduce an error of more than 0.2 km to positions received from LUTs/MCCs.

10.9 The FG USMCC shall geographically sort positions to within 25 km of agreed boundaries between SRRs.

10.10 The FG USMCC shall maintain time reference accurate to within 25 seconds.

10.11 The FG USMCC shall not corrupt data it receives or sends.

10.12 The FG USMCC shall be available 99.5% over a period of one year.

10.13 The FG USMCC shall have archived data available from last 30 days and be able to retrieve it within 60 minutes, suppress data within 10 minutes, complete backup procedures within 60 minutes, provide registration data within 30 minutes and retrieve alert/system data from preceding 48 hours within 30 minutes. The FG USMCC shall have all archived data that is older than 30 days available for retrieval within 24 hours.

10.14 Message transfer time between the FG USMCC and other nodal MCCs shall not exceed 15 minutes.

10.15 Inter-nodal MCC communication availability shall be greater than 99.5% during each calendar day.

10.16 The FG USMCC shall implement back-up procedures if its non-availability is expected to exceed four hours.

11.0 Incident History Data Base

The FG USMCC shall provide the capability to store information provided by RCCs and SPOCs within the US Service Area (SA) in response to the request for feedback information attached to 121.5 MHZ composite messages and 406 MHZ unlocated and first alert messages. The information shall be accessible through connection to the USMCC computer system.

Requirements

11.1 The FG USMCC shall store online in an Incident History Data Base (IHDB) data collected automatically for each closed 406 MHZ site and 121/243 MHZ composite site in the USMCC Service Area. These data elements are defined in Appendix G.

11.2 The FG USMCC shall have the capability to automatically merge information collected as part of the morning report with site information collected for the IHDB.

11.3 The FG USMCC shall have the capability to update site information manually and (in the future) automatically from information gathered from feedback sheets and other sources.

11.4 The FG USMCC shall have the capability to retrieve data based on site ID or 406 beacon ID.

11.5 The FG USMCC shall maintain the capability to sort and retrieve data for analysis and reporting. This data shall be made available as displays in either graphic or tabular form. Options shall be provided to either print the displays or, where appropriate, write the data to a file. This will include as a minimum:

11.5.1 406 MHZ Non-distress Beacon Activations by Manufacturer (over selected time periods) including

- 11.5.1.1 Comparison of activations by manufacture
- 11.5.1.2 Non-distress 406 MHZ beacon activation by category (i.e., user error, beacon problem, bracket problem, unknown)
- 11.5.1.3 Distress vs. Non-distress beacon activation
- 11.5.1.4 Summary of manufacturer beacon activations for a quarter
- 11.5.1.5 Summary of manufacturer non-distress beacon activations
- 11.5.1.6 Detail summary of manufacturer non-distress activations
- 11.5.1.7 Monthly summary of manufacturer beacon activations
- 11.5.1.8 Summary of all US vs. Non-distress beacon activations.

11.5.2 Us 406 MHZ Registered Beacon Activations over a selected time broken out by model generation.

11.5.3 Beacon Manufacturer Saves Reports either printed or written to a file. (Reference Appendix M for format)

11.5.4 Incident Feedback broken out by RCC (percent returned by beacon frequency)

11.5.5 Incident History Saves Reports (Reference Appendix M for format)

11.5.6 Report on Beacon Signals - broken out by beacon frequency and further broken out by distress, non-distress and unknown categories. The non-distress cases shall provide further information on the number/percent that, as a minimum, were user error, test, bracket problems and beacon problems.

11.5.7 Saves Counts - by RCCs or States over a specified period for 121/243MHz and 406 MHZ.

11.6 The Incident History Data Base shall also allow for ad hoc queries to support specific case studies.

12.0 406 MHz Beacon Registration Data Base (406 RDB)

The FG USMCC shall provide a 406 MHZ Beacon Registration Data Base capability (406 RDB) to store all registration information for 406 MHZ beacons that have been approved by NOAA for entry into the data base.

Requirements

12.1 The FG USMCC shall have the capability to store up to 250,000 beacon registrations.

12.2 The FG USMCC shall have the capability to store the registration information from any type of 406 MHZ beacon including ELT, EPIRB and PLB.

12.2.1 This information shall include the date of the original registration.

12.2.2 At the time of initial registration, the FG USMCC shall produce a confirmation page to be sent to the registered beacon owner along with a decal confirming that the beacon was registered with NOAA. The decal shall include the beacon ID, expiration date, and, where appropriate, the vessel name.

12.3 The FG USMCC shall be able to retrieve all information for any beacon in the data base.

12.4 The FG USMCC shall register only US MID coded beacons (MID=366,367).

12.5 Registrations must include the 15 character hexadecimal code of the beacon and additional vital information such as owner name, emergency points of contact, radio call sign or vessel name.

12.6 The FG USMCC shall respond to SAR-related inquiries regarding its 406 MHZ beacon registrations. These inquiries may only come from other MCCs, SPOCs or RCCs. All private inquiries shall come as FOIA requests.

12.7 The FG USMCC shall confirm all registrations every two years. This information shall be stored in the 406 RDB.

12.7.1 The FG USMCC shall prepare confirmation information to be sent to the owner of the registered beacon.

12.7.2 When the confirmation is returned, the FG USMCC shall accept any and all modifications and produce a decal confirming that the beacon was registered with NOAA. The decal shall include the beacon ID, expiration date, and, where appropriate, the vessel name.

12.8 The FG USMCC RDB shall have the capability to flag beacons that are reported as lost or stolen.

12.9 The FG USMCC shall be able to retrieve and display:

12.9.1 Monthly totals of decal confirmations returned

12.9.2 Registration information based on

12.9.2.1 Beacon ID
12.9.2.2 Vessel/Aircraft Name [Note]
12.9.2.3 Owner Name [Note]
12.9.2.4 Registration Number
12.9.2.5 Radio Call Sign

Note: The USMCC shall employ fuzzy logic to retrieve these items such that all registrations whose owner name or vessel/aircraft name is close to the retrieval input parameter are listed for inspection and selection for further viewing.

12.9.3 Monthly totals of registrations entered into the database.

12.9.4 Registration counts by:

12.9.4.1 Special User Code (Spare Bits)
12.9.4.2 Beacon Manufacturer
12.9.4.3 Beacon Type (ELT, EPIRB, PLB)

13.0 Self-test And Monitoring System (SAMS)

The FG USMCC shall have the capability to collect status information daily and provide information to remote users on performance levels and performance trends with the US Ground System and Cospas-Sarsat system elements including reference beacons and satellites.

Requirements

13.1 The FG USMCC shall collect and make available for display Exceptions Reports which provide a brief summary of instances meeting certain exception criteria including:

- 13.1.1 LUT Pass Exceptions shall list any pass at a US LUT for which the LUT action, as indicated by the PCR, does not agree with the USMCC schedule.
- 13.1.2 LUT/MCC Timing Exceptions shall list passes for which the LUT processing time, or the MCC processing time exceeded 30 minutes.
- 13.1.3 Satellite Throughput Exceptions shall monitor satellite throughput.
- 13.1.4 406 MHZ Active Site Exceptions shall list data for all sites closed in the last day with one or more solutions more than 120 km from the site composite location.
- 13.1.5 Orbitography Beacon Location Exception Errors of 1000 Km or More Analyzed by LUT, Satellite and Orbeacon shall list errors over 1000 km. These parameters are sensitive indicators of system performance.
- 13.1.6 Orbitography Beacon Location Exceptions Errors of 120 Km or More shall list by TCA all LUT solutions with east or north error over 1000 KM.

13.2 The FG USMCC shall collect and make available for display data on system Availability. These displays shall indicate the extent to which the various system components were functioning or not functioning during the preceding 30 days. The Availability data shall include:

- 13.2.1 Single LUT information including:
  - 13.2.1.1 Passes Completed shall show, for each US LUT unit, how many passes were successfully completed in each of the last 30 days.
  - 13.2.1.2 Percent of MCC Schedule including:
    - 13.2.1.2.1 The Percent of MCC Schedule Completed - Last 30 Days shall present a general measure of availability of the LUTs relative to the tracking schedule produced by the USMCC.
    - 13.2.1.2.2 USMCC Predicted Passes - Completed/Not Completed shall show the number of passes completed and not completed over the preceding 30 days according to status of the pass as determined in the USMCC. The status categories include No Conflict, Accepted, Rejected, and Low Angle.
  - 13.2.1.3 Percent of Visible Passes - Last 30 Days shall show the percent of all visible passes that were successfully completed by each LUT.
  - 13.2.1.4 Percent below Visibility- Last 30 Days shall show LOW ANGLE passes as a percent of all passes at the LUT.

13.2.2 Dual LUT information shall show the same as those as single LUTs except that the two LUT units at a site are treated as a single unit.

13.2.3 Satellite information shall show 406 MHZ burst message throughput for the last 30 days. This data shall show, for each satellite, the percentage throughput for each of the last 30 days for all orbitography beacons with TCAs in that day.

13.2.4 Beacon data shall show Orbitography beacon burst reception for the last 30 days. These data shall provide an overview of burst reception from each orbitography beacon over the last 30 days.

13.3 The FG USMCC shall collect and make available for display data on system Performance. The Performance data shall indicate how well the various system elements functioned during the preceding 30 days. The Performance data shall include:

13.3.1 121.5-MHZ Location Accuracy shall show the location accuracy of operational 121.5/243-MHZ from all Active Sites that have been closed in the thirty days prior to GMT midnight.

13.3.2 406-MHZ Location Accuracy shall show location accuracy of 406- MHZ operational beacons derived from the same source and in the same way as that for the 121.5/243-MHZ beacons {13.3.1 above}.

13.3.3 Orbitography beacon Location Accuracy shall include:

13.3.3.1 Scatter plots of orbitography beacon errors from data taken over the past two GMT days grouped by LUT.

13.3.3.2 Scatter plots of orbitography beacon errors from data taken over the past 2 GMT days grouped by satellite.

13.3.3.3 Scatter Plots of orbitography beacon errors from data taken over the past 2 GMT days grouped by orbitography beacon

13.3.3.4 Daily Plots of orbitography beacon RMS errors grouped by LUT and satellite. Which shall allow a selection of any one of the US LUTs and view the RMS error for that LUT for each of the last 30 days. Location error here shall be computed as the distance from the beacon's actual location to the location indicated by the LUT.

13.3.3.5 Pass Parameter graphs shall show the distribution of orbitography beacon errors in five ranges, and for eight pass -dependent parameters.

13.3.3.6 A set of bar charts which provides orbitography beacon errors/percent over 5km for the last 30 days by Filter, Beacon, Satellite, and LUT

13.3.4 System Timing data and displays shall include:

13.3.4.1 LUT processing - LUT processing time shall be computed as the time from LOS to processing complete, as reported by the LUT in the Pass Completion Report {PCR} for the pass.

13.3.4.2 LUT-MCC Communication Time shall be computed as the time from LUT processing complete, as reported in the PCR, to the time the last data file or PCR for the pass was received by the USMCC from the LUT as recorded by the MCC.

13.3.4.3 MCC Processing Time shall compute and display data depicting the

time from first receive at the MCC to first send from the MCC, for each LUT pass during the preceding 30 days. It also shall compute and display the time from receipt of the last data for a LUT pass to the time the MCC processing is complete for that pass.

14.0 LUT Monitoring Data Base (LMDB)

The USMCC shall have the capability to collect data on LUT performance based on satellite pass data transmitted by the LUTs to the USMCC. This data shall enable determination of LUT performance particularly with regards to missed passes. The information in this data base shall be used to validate LUT maintenance vendor charges.

Requirements

14.1 The FG USMCC shall collect and store data from each pass from a US LUT. This data shall include satellite ID, pass number, AOS, LOS, number of 121/243 MHZ solutions, number of 406 interferer solutions, number of 406 MHZ operational beacon solutions and number of 406 MHZ test and orbitography beacon solutions.

14.2 The FG USMCC shall monitor missing satellite passes.

14.3 The FG USMCC shall monitor when no 406 MHZ solutions are received from a satellite with global data processing capability.

14.4 The FG USMCC will also verify that header records are received for each type of LUT file expected.

14.5 The FG USMCC shall store this information in a shared data base that can be viewed from remote workstations.

14.6 The FG USMCC shall produce regular reports that detail LUT performance relative to missed passes, missing header records and missing data.

15.0 Operations Staff

The FG USMCC shall be operated by a staff of trained, certified controllers who will be the point-of-contact for day-to-day operational questions.

Requirements

15.1 The USMCC operations staff shall operate USMCC equipment 24 hours/day, 7 days per week; monitor hardware maintenance under government-provided vendor maintenance contracts; maintain USMCC system documentation, computer systems manuals (provided by hardware vendors), records of operations staffing and records of equipment repairs as well as be responsible for supplies (GFE).

15.2 The USMCC Operations staff shall provide status reports each workday morning to the DSD staff. This report shall cover a 24 hour period and report on:

15.2.1 Ground system status including MCC, US LUT and Communications status. The US LUT status shall report on any missed passes recorded in the LMDB.

15.2.2 SAR incidents involving distress situations.

15.2.3 The number, type and MID Code of the 406 sites within the US Service Area and closed within the appropriate 24 hour period. Further elaboration shall be provided in the 406 Information sheets (Appendix F.) Provided automatically by the system.

15.2.4 Total Beacon Sites closed in the appropriate 24 hour period for 121.5/243 MHZ and 406 MHZ.

15.2.5 Notes of significant problems

15.2.6 406 RDB Summary including the number of:

- 15.2.6.1 Beacon Registrations in Database
- 15.2.6.2 Beacon Registrations Received
- 15.2.6.3 Beacon Registrations Entered (Decals Mailed)
- 15.2.6.4 Beacon Registrations to Be Entered
- 15.2.6.5 Decals Generated from Confirmations Received
- 15.2.6.6 Decals Generated from Unsolicited Changes
- 15.2.6.7 Beacon Registrations Updated

15.3 The USMCC operations staff shall monitor missed LUT missed passes and record appropriate information in the LMDB including whether or not the pass can be excused. The USMCC operations staff will investigate as much as possible causes for a pass being missed including communications and power outages before notifying the LUT maintenance vendor.

15.4 The USMCC operations staff shall maintain a list of contact points for LUT sites to be called

in the case of suspected power failures.

15.5 The USMCC operations staff shall investigate all communication failures and notify and open trouble tickets with the appropriate communication vendor. The USMCC operations staff shall monitor the status of these trouble tickets until they are closed.

15.6 The USMCC operator shall recognize any failure in the USMCC hardware or system software and take appropriate action to reconfigure/back-up failed components. This may include a service call for hardware maintenance or coordination with US LUTs to provide data directly to the RCCs.

15.7 The USMCC operator shall be trained to be fully responsive to the needs of US RCCs, US SPOCs, and foreign MCCs. The operator shall have the capability to monitor, retrieve, create, edit, and transmit messages according to agreed upon national and international formats when not done automatically by the system.

15.7.1 The Operator will monitor the flow of the following types of messages:

15.7.1.1 Spacecraft Information (Telemetry, Time Calibration, Orbit Vectors, Commands)

15.7.1.2 LUT, CEMSCS and MCC data files

15.7.1.3 MCC and system narratives

15.7.2 The USMCC operator will monitor and respond as appropriate to all Operator messages.

15.7.3 The USMCC operator, in the event of a change in status of subsystems of the USMCC, the SARSAT Ground System, or the COSPAS/SARSAT system, shall have the capability to determine the appropriate reconfiguration, or approve the automated reconfiguration so as to achieve the following action priorities:

15.7.3.1 Receiving, processing, and transmitting 406, 121.5, and 243.0-MHZ ELT/EPIRB/PLB alert messages, to both US RCCs and foreign MCCs.

15.7.3.2 Active Site Support.

15.7.3.3 System failure detection, warning and reconfiguration including emergency SARR/SARP commands.

15.7.3.4 Receiving, processing, and transmitting SARR, SARP, or SARM telemetry messages regarding failure or out-of-tolerance conditions.

15.7.3.5 Significant status, command or narrative messages concerning any

major element of the COSPAS/SARSAT system, including spacecraft, LUTs, MCCs or supporting elements.

15.7.3.6 Orbital update messages.

15.7.3.7 Routine spacecraft and system status messages.

15.7.3.8 Narrative Messages (general).

The operator shall determine the nature, extent and cause of the unscheduled outage, obtain an estimated time of recovery and inform all users and affected parties of these circumstances.

15.8 The USMCC Operator shall handle system notifications including:

Non verification of Pass Schedules by the LUTs
Time calibration error messages
Orbit vector error messages
Spacecraft command messages and command schedule verification
Non-receipt of orbit vectors

15.9 The USMCC Operator shall be capable of producing and retrieving reports on the operation of the USMCC.

15.10 The USMCC maintenance personnel shall support NOAA for SARNET Data Terminal Equipment Maintenance. They shall:

15.10.1 Have available trained personnel who can assist the RCC personnel in attempts to fix problems without removing equipment.

15.10.2 Maintain a sufficient inventory of equipment spares so that RCC personnel can exchange broken equipment. New equipment shall be shipped within 24 hours after notification that a unit is down and cannot be fixed on site.

15.10.3 Arrange for repair of broken equipment.

15.11 USMCC operations personnel shall provide the following support for USMCC Data Base Administration:

15.11.1 Supervise and perform entry of 406 MHZ Beacon Registration Data into the 406RDB. All registration information shall be entered into the data base within 48 hours of receipt of the registration form.

15.11.2 Supervise and perform entry of hardcopy information into the IHDB.

15.11.3 Be responsible for the USMCC archive and back-up operations.

15.11.4 Be responsible for procedures to allow remote access to the USMCC Data Base System.

15.12 New USMCC operations personnel shall be fully trained before assuming shift duties. They shall be required to pass a written and “hands on” demonstration test program approved by NOAA.

16.0 406 MHz INTERFERENCE MONITORING REQUIREMENTS

The 406 MHz Interference Monitoring Subsystem functions involve the processing of data from interference sources in the 406 MHz band. The data is received from US LUTs and other MCCs. The processing includes validation, match/merge, interference site alert generation and distribution, and transfer of both interference match/merge and raw elemental solutions to the off-line Automated Interference Monitoring System (AIMS) for further analysis.

Requirements

16.1 The USMCC shall process MCC and LUT interference data, preform match/merge processing, store and transmit acceptable (passed quality checks) interference solutions in real time. Specifically, the USMCC shall:

16.1.1 Perform a reasonableness check on input data (e.g., the position is a valid geographical position, the TCA is a valid TCA, data from MCCs follow SID standards) to identify extreme, or erroneous solutions.

16.1.2 Have the capability to filter data (perform exception processing) based on geographic location, satellite, and/or frequency, The USMCC shall have the capability to perform special processing on this filtered data (e.g., remove it from match/merge processing, or route it to special destinations).

16.1.3 Match and merge data from different sources and satellite passes to create interference sites. Data will be matched and merged for a single pass (interference data from the same satellite pass but from different sources) and for multiple pass (interference data from different satellites and/or orbits, and from one or more sources). All solutions ("A" and "B") should be considered for the match/merge process.

The match process shall identify all data that is believed to be from the same transmitting source site and be configurable based on at least:

- TCA/Time data was received;
- Location proximity;
- Frequency bias seperation; and
- Signal to Noise Ratio

Data determined to be from the same transmitting source shall be merged to improve the location accuracy. The data shall be merged using a Kalman Filter, batch least squares or equivalent process. The merge should be configurable based on at least:

- TCA;
- Geographical location;
- Curve duration;
- Latitude/longitude standard deviation; and
- Latitude/longitude correlation coefficient.

Additional information on match/merge can be found at section 4.6.1.

16.1.4 Have the capability to close sites (where they are no longer available for match/merge) based on:

- Time; and
- Non-detection of the interfering source on "n" number of subsequent predicted satellite passes (taking into account mutual visibility)

Additional information on site maintenance is available at sections 4.8 and 4.10.

16.1.5 Geographically sort the position (based on SRRs or on configurable boundaries) and determine the recipient of interference alerts.

16.1.6 Have the capability to generate an interference alert message as described in Appendix O.

[TBD]

16.1.7 Have the capability to use the Communications Subsystem of the USMCC to route interference alerts via Sprint's X.25 network to the NOAA RCC. A capability shall also exist to use MCI's SAFE system and X.400 system to route interference alerts to configurable sites equipped with a fax number or an e-mail address.

16.2 The USMCC shall maintain site (open and closed) data and raw elemental data on-line for [one] year, after which time data should be archived. The structure of open and site data shall be the same as 121.5/243 MHz sites described in the Data Structures Document. Additionally, the site structure should allow a range of associated frequencies for a transmitter to be stored.

16.3 The USMCC shall make available a copy of all site and raw elemental data for off-line analysis. The processing of the USMCC Interference Monitoring Subsystem shall not be affected by manual access to copied data.

16.4 The USMCC shall make log entries in the appropriate system and operator logs and raise alarms to the operator based on a priority that is configurable.

16.5 The USMCC shall have an interface to query sites or raw elemental data based on:

- Time;
- Source;
- Satellite;
- Geographical location (rectangular box or point/radius); and/or
- Frequency.

The output of the query is described in Appendix P.

16.6 The USMCC shall have the capability to manually generate the reports contained in Appendix Q. Additional guidance is available in documents C/S A.003

16.7 The USMCC shall have the capability to store feedback regarding an interference site. Additional information is available in document C/S A.003, Table C.1.

16.8 The USMCC shall have the capability to display interferers on a map.

16.9 The USMCC shall meet the following performance requirements:

a) Input data shall be processed (match/merge, message generation, and appropriate copies created) in less than [5] minutes.
b) USMCC computations shall not introduce mare than [0.1] km to the position error received from LUTs or MCCs
c) Geographically sort interferer positions to within 25 km of agreed MCC boundaries and within [10] km of other boundaries.
d) Subsystem, as part of the USMCC, shall be available at 99.5% over a period of one year.
e) Subsystem shall retain interferer data online for at least one year, after which it should be archived.